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SUBSTANCE OF SOVIET CONFLICT ON SEDIMENTARY PETROGRAPHY

The two conflicting positions in present-day Soviet sedimentary petrography are developed at length in two papers: "The Problem of Principles in the Science of Sedimentary Rocks," by L. V. Pustovalov, and "The Problem of the General Theory of the Sedimentary Process," by N. M. Strakhov, presented in Izvestiya Akademii Nauk SSSR, Seriya Geologicheskaya, No 4, 1950. These two long articles, totaling 80 pages, represent a maze of charges and recriminations plus dialectical declamations and therefore do not superpose uniformly to permit a point-by-point comparison of the positions developed. However, the salient features seem to be the following:

Firstly, the principle of periodicity in sediment formation, espoused by Pustovalov, is based on the idea of sequential development of all geological factors of the earth, including inorganic nature, and thus also sedimentary deposits. The sedimentary process, according to Pustovalov, is not a series of chance events, but a regularly developing and nonrepetitive process involving new conditions of sediment formation. In this view, chemical sediments are a natural development of detrital sediments. In this particular part of the general argument, Strakhov states that "development of chemical sediments as a whole within each rhythm is in nowise a continuation in time of the development of detrital sediments as is sometimes thought."

The assertion of many geologists, including the Germans Bubnow and Weinschenk and the American Pettijohn, that differences in the composition of sedimentary formations from early Pre-Cambrian up to the present are inconsequential, is anathema to Pustovalov. This principle, he states, is antidialectical. As a matter of fact, Pustovalov devotes three pages to identification of capitalistic foreign science with denial of development of inorganic phenomena and consideration of sedimentary rocks as irregular "chance" formations. He then attempts to identify Strakhov with the above principles, thus indirectly linking him with capitalistic foreign science. Strakhov is not the only offender, according to Pustovalov; others guilty of asserting that "any rocks are characteristic of each geological period" are Professor A. N. Mazarovich, V. I. Lichitskiy, and A. N. Zavaritskiy.

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Strakhov is careful not to criticize the principles underlying Pustovalov's theory of periodicity, but maintains that the law of periodicity was established without any real inspection of the actual stratigraphic distribution of rocks even on one real section of the earth's crust and thus represents a purely specious bit of inductive reasoning by its author. Strakhov therefore endeavored to pick out many specific errors in Pustovalov's diagram of periodicity in mineral sediment formation (first given in his book Petrography of Sedimentary Rocks, Gostoptekhizdat, 1940) which diagram was supposed to be for the European USSR. For example, the diagram showed an abundance of detrital rocks for the Upper Silurian, whereas actually there are almost none on the Russian platform, the S_2 here being almost solidly carbonate. Strakhov frankly admits that many of his studies were undertaken specifically to check various of Pustovalov's assumptions. He counters with his own system of periodicity of sediment formation from the standpoint of comparative lithology. Pustovalov states that each time that someone has attempted to use comparative lithology for the study of a certain object, it has led to erroneous results. Furthermore, Pustovalov continues, he cannot cite one convincing example where the geological conditions of the past have been reconstructed by methods of comparative lithology.

The second major criticism hinges around Pustovalov's theory of chemical differentiation, according to which sediments in transport should be settled out in a definite order, namely: (1) oxides of iron and other heavy metals; (2) colloidal silica; (3) alumina; (4) ferrous iron silicates; (5) calcium carbonates; (6) magnesium carbonates; and (7) sulfates and halides. Pustovalov assumed that from a region of intensive destruction of magmatic rocks the most diverse substances simultaneously entered into migration in the same direction in the form of molecular and colloidal solutions and moved from river waters into coastal salty waters and then entered into marine reservoirs.

Strakhov finds much to criticize in this theory. First, it was drawn up for an arbitrary river and an arbitrary marine reservoir and is illustrated by only one practical example, the Upper Permian deposits of the Tatar ASSR.

It is worthwhile here to cite one of Strakhov's footnotes which rather neatly sums up his whole argument, i.e., that Pustovalov's concepts are merely deductive generalizations which have not been checked by field studies: "Before presenting his system [of chemical differentiation], L. V. Pustovalov warns that this system was drawn up with consideration for geological observations on the successive change of various types of sedimentary rocks of the USSR in both the vertical and horizontal directions and on the preferential adaptation of various synchronous sediments to definite facies and also with consideration for our knowledge of the geochemical behavior of various compounds and elements in a sediment-formation zone." We note, however, that all these actual observations are not given in the book before the system of chemical differentiation is introduced as is customary in lithological works, but are given in passing while developing the system itself and then only in such a general and intangible form that it is frequently difficult to determine what in these observations is actually taken from the facts and what is taken from the preconceived notions of Pustovalov. Analysis of two illustrations given by Pustovalov shows that his idea of factual material is highly original."

Second, according to Strakhov, even for the single example given, objective analysis of the lithology of Upper Permian rocks of the Tatar ASSR shows that these rocks do not conform to Pustovalov's system of chemical differentiation.

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Thirdly, Strakhov asserts, Pustovalov failed to take into account the real form in which chemical components are transported in rivers. Pustovalov assumed, states Strakhov, that they are transported in the form of molecular or colloidal solutions, whereas actually, he continues, as proven by hydrological studies of the Syr Dar'ya, Amu Dar'ya, Volga, Dnepr, and many other rivers, the majority of elements are transported in suspensions.

Pustovalov does admit errors in his text Petrography of Sedimentary Rocks, namely schematic nature of presentation, inaccurate formulation of physico-chemical development of sedimentary rocks, and insufficient attention to climate and organisms as sediment-formation factors. He maintains, however, that the very fact that each issue of Izvestiya Akademii Nauk SSSR, Seriya Geologicheskaya contains more and more works developing, supplementing, and criticizing the problems set forth in his book, such as periodicity of sediment formation, sedimentary differentiation, paragenesis of sedimentary rocks, regularities in their composition, arrangement, etc., proves that his generalizations were timely and effective.

In summarizing, therefore, it appears that Pustovalov would attempt to first deduce broad generalizations and have them used in practice to confirm, revise, or reject them, while Strakhov would attempt to accumulate a vast amount of factual data from which generalizations could be deduced. The two papers reflect this, for in Pustovalov's we find discussions of broad general problems with almost no mention of specific periods, formations, or minerals, while Strakhov's is full of references to specific periods, etc., obtained from his own and others' works.

It may be noteworthy that (1) Pustovalov cites four foreign sources and criticizes three; Strakhov cites seven foreign references and uses all to support his arguments; (2) Pustovalov uses no fewer than 15 quotes from Engels, Marx, and Stalin (he even quotes Lysenko) while Strakhov used only one quote from I.P. Pavlov; and (3) Pustovalov frequently refers to state care for science and the possibility of solving problems only by using the dialectical method while such references are very uncommon in Strakhov's work. It will be interesting to note whether the conference on the lithology and petrography of sedimentary rocks which will be held early in 1951 provides further developments in this controversy.

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